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Field Experiments in Spraying for Control of San Jose Scale, 1919

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INTRODUCTION

Lime-sulfur solution has been the insecticide depended upon for a number of years for control of the San Jose scale. Several disadvantages attend the use of this material, chief of which are the losses due to leakage, the liability to freezing, the difficulty of handling by inexperienced workmen, and the expense of shipment.

For several years some of the largest manufacturers of insecticides have put on the market, in dry form, combinations of sulfur and other chemicals, making strong claims for their efficiency in controlling the San Jose scale. Orchardists have been greatly interested in these materials, as shown by the large number of inquiries received concerning them. The present investigation has been undertaken with the object of making a thoro field test of some of the more largely advertised materials. *The data here presented constitute no adequate basis for a recommendation of any of these compounds; they are merely a record of the results of a single season's tests and comparisons.* Further results will be published as obtained.

A number of chemical analyses have been published showing that solutions made with dry materials of the strength recommended by the various manufacturers, do not contain as much sulfur as is generally considered necessary in lime-sulfur solutions for the control of San Jose scale. However, the few field tests reported seem to show that some of them have considerable merit.[1]

[1]Idaho Agr. Exp. Sta. Bul. 108, p. 9. Melander, A. L., Better Fruit, Vol. XIV, No. 1, p. 10. July, 1919.

THE BASIS OF LIME-SULFUR EFFICIENCY

Lime-sulfur solutions as offered by the manufacturers test from 30° to 34° on the Baumé scale, or 1.261 to 1.306 specific gravity, and contain approximately 25 percent of total sulfur. Each gallon of such a concentrated solution contains about 2¾ pounds of sulfur. Previous experiments have shown that a lime-sulfur solution testing 1.03 specific gravity, or 4.3° Baumé, and containing about 30 pounds of sulfur in each one hundred gallons of spray, is the effective minimum for scale control.[1]

Dry lime sulfur is guaranteed by the manufacturers to contain the following substances:

	Percent
Active ingredients	83.0
Calcium polysulfid	70.00
Calcium thiosulfate	5.0
Sulfur	8.0
Inert ingredients	17.0
Total sulfur	49.65

The recommendation for the use of this material is 10 to 14 pounds in fifty gallons of water. Since 49 percent of the material is sulfur, if the higher strength is used, or 28 pounds in one hundred gallons of water, the resulting solution will contain approximately 14 pounds of sulfur—not quite half as much as the generally accepted minimum for the liquid lime sulfur.

DESCRIPTION OF EXPERIMENTS

Duplicate experiments were planned to be conducted independently, the grading to be done at the same date, each experimenter being ignorant of the outline and treatment of the plot being graded.

LOCATION AND CONDITION OF ORCHARD

The orchards selected for the experiments are near Barry, Pike county, and Quincy, Adams county.

The orchard in Pike county is located one and one-half miles west of Barry and contains about forty acres of mature Ben Davis trees. The block selected in the Barry orchard adjoined an Osage hedge which was probably the original source of the scale infestation. The trees nearest the hedge were incrusted and, untreated, would almost certainly have failed to survive the season of 1919. At a distance of two hundred feet from the hedge the infestation was not quite so serious, but many of the limbs were incrusted. The plots were

[1]Ohio Agr. Exp. Sta. Circ. 143, p. 60. Ill. Agr. Exp. Sta. Bul. 180, p. 561; Circ. 180, pp. 20-22. New York (Geneva) Agr. Exp. Sta. Bul. 330. U. S. Dept. Agr. Farmers' Bul. 908, p. 24.

arranged to include each degree of infestation, and were as nearly uniform as possible.

The orchard near Quincy, situated two miles east of the city, on the farm of Wm. Hausemann, consisted of six acres of seventeen-year old trees of mixed varieties, Ben Davis and Grimes predominating. There was a uniformly heavy infestation of scale thruout the orchard, all trees showing some limbs incrusted. The majority of these trees would probably not have survived the season of 1920 if no treatment had been given.

MATERIALS USED

The materials and the strength at which each was used were as follows:

Commercial concentrated lime sulfur 33° Baumé, 1 gallon to 8 gallons of water
Scalecide, 1 gallon to 15 gallons of water
B. T. S., 14 pounds in 50 gallons of water
Niagara soluble sulfur, 12½ pounds in 50 gallons of water
Sherwin-Williams dry lime sulfur, 15 pounds in 50 gallons of water
Dow dry lime sulfur, 15 pounds in 50 gallons of water
Check: unsprayed

TIME AND METHOD OF APPLICATION

Barry Orchard.—The sprays were applied March 28, 1919, with a "Bean" duplex power outfit at a minimum pressure of 250 pounds. There was a brisk west wind which made it necessary to use a spray gun in order to make the application from all sides of the trees. The tops of the trees were covered by a rod, and whirlpool disc nozzles were operated from the tower. The gun was operated from the ground. The weather was warm and the first leaves were beginning to show green. About nine gallons of material was used to each tree.

Quincy Orchard.—The sprays were applied March 27, 1919, with a "Friend" power outfit, using from 250 to 275 pounds' pressure. The tops and upper sides of the branches were sprayed with a gun from the tower, the undersides being covered with a rod used from the ground. A third man stood at a little distance from the sprayer to call attention to any parts of the tree that were missed. In this way, a very thoro application was made to all parts of the trees, about eleven gallons of solution being used per tree.

The weather was warm, with bright sun and a light wind. The leaf buds were just bursting, nearly all of them showing a little green.

RESULTS

The orchards were graded July 21 and 22, by both experimenters, working independently, neither knowing the kind of treatment applied to the plots except in the orchard under his personal supervision. Each tree in a given plot was graded separately, and a general average for the plots was determined. The results were then compared and tabulated as shown in the following table.

SAN JOSE SCALE EXPERIMENTS, 1919

Plot No.	Treatment	Control	
		Barry	Quincy
1	Commercial lime-sulfur solution, 1 gallon to 8 gallons water	Good	Good
2	Niagara soluble sulfur, 12½ pounds to 50 gallons water	Excellent	Excellent
3	B. T. S., 14 pounds to 50 gallons water	Fair	Good
4	Sherwin-Williams dry lime sulfur, 15 pounds to 50 gallons water	Excellent	Excellent
5	Dow dry lime sulfur, 15 pounds to 50 gallons water	(1)	Excellent
6	Scalecide, 1 gallon to 15 gallons water	Excellent	Excellent
7	Check: unsprayed		

[1]Material failed to arrive in time for application.

In the above table the terms used indicate that a plot graded as "Fair" showed a considerable number of live scale present on all parts of the tree and fruit; "Good" indictes scattered living scale, fairly easy to find, but not numerous enough to cause marked blemishes on the fruit or injury to the trees; and "Excellent" indicates living scale difficult to find and no blemishes on the fruit.